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D-DAY AND THE SEABEES

Freight cars are unloaded from U.S. Navy landing ship tank (LST). Seabees and U.S. Army engineers built the railway landing ramp.

Cover: Photos courtesy of Raymond B. Dierkes, formerly of the 108th Naval Construction Battalion. The photos were taken by his buddies in the 108th NCB. Cover layout by Bill Brack, Naval Facilities Engineering Command Headquarters, Alexandria, Va.

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Jack E. Buffington
Rear Admiral, CEC, USN
Commander,
Naval Facilities Engineering Command
and
Chief of Civil Engineers

Robert M. Gallen
Rear Admiral, CEC, USN
Vice Commander,
Naval Facilities Engineering Command
and
Deputy Chief of Civil Engineers

Elaine L. McNeil
Public Affairs Officer,
Naval Facilities Engineering Command

Karen Fedele
Editor,
Navy Civil Engineer Magazine
and
Assistant Public Affairs Officer,
Naval Facilities Engineering Command

Editorial Offices
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Speaking from Topside

This edition of *Navy Civil Engineer* covers an event that took place more than 50 years ago—the D-Day invasion of Normandy. We have all been taught to embrace the lessons of history if we are to plan for the future. I encourage each of you to visualize what the Civil Engineer Corps would need to do today to be ready to clear the same or similar logistics hurdles as those faced in France. What resources would be required, how would modern technology help and would our commitment and standards be what are needed?

My sense is that we will have great modern technology. And because of our new focus on improvement and our adaptability to change, we would make the commitment. One ingredient we must strive for as we chip away at the bureaucracy is *high standards*. However, in obtaining high standards and quality-producing processes, we must not "throw the baby out with the bath water."

Total Quality Leadership (TQL) will help us achieve high standards if we focus on processes and process improvements. Unfortunately, today at many of our bases and on many of our staffs, we start down the TQL path but then get sidetracked by a "new and better" training program or a more sophisticated approach to TQL. The result has been a very disjointed approach to TQL and a poor track record on process review.

The most important concrete step in TQL (after leadership commitment) is *process review*, with its PLAN-DO-CHECK-ACT cycle. After we've looked at our processes, we are then able to establish the high quality product or standard that will benefit our customers now and will equip us for the future. At present, we have abandoned old bureaucratic processes and haven't yet come up with the "new, improved models." We will need a way to measure our progress in meeting those new high standards, once established.

Another important ingredient for success is, and always has been, good and caring leadership. Leaders should be able to solve problems. They are more than efficient managers who focus on *things*. Leaders create success *through* people and *with* people. Today, it is becoming even more difficult to be a leader, when some managers wish that all contact with the outside world would be through the impersonal modem or a fax machine. The chemistry of people working with people must remain important as we team-build and as we monitor and change our work processes. Future leaders will have to be master chemists to make all the people participating in a process work well together.

The American people want Navy leaders to provide the best facilities support to the finest Navy in the world. Leadership, TQL application, a positive attitude about the future and enjoying what we are doing, will help the Corps be ready for whatever comes our way.

RADM Robert M. Gallen, CEC, USN

As the Bos'n on the watch used to say, "Hold what you got, and take in the slack." The challenges ahead are to take in the management "slack" with good leadership. If we don't, our rudder will be amidships and we will drift into an engineering comfort zone where little progress is made and a bureaucracy grows at our mid-section. History will speak kindly of us if we set high standards and focus on improving processes. Let's lead . . . and only manage enough to keep order.

R. M. Gallen

ROBERT M. GALLEN
Rear Admiral, CEC, USN
Vice Commander,
Naval Facilities Engineering Command
and
Deputy Chief of Civil Engineers

D-Day: The Seabees were there!

By CAPT Palmer W. Roberts, CEC, USN (Ret)

"O.K., let's go!"

The terse announcement by General Dwight D. Eisenhower, supreme commander of the allied expeditionary force, signaled his decision to launch Overlord, the invasion of German-occupied Europe on June 6, 1944. Although marshaling of forces had begun in late May, with an earlier attack date anticipated, poor weather and sea conditions stalled the initial plans. Then, with moderating wind and sea conditions forecast on June 5, the supreme commander made his critical decision that established D-Day as a turning point in history.

Overlord became the first fully developed operation of its kind and involved more than 1.5 million troops, 2.5 million tons of material, 11,000 aircraft and 5,000 ships and crafts.

Seabee operations during World War II are normally associated with the Pacific theater of war, where their construction efforts throughout that vast area were truly massive and impressive. However, Seabees and the Civil Engineer Corps were recognized elements in the success of D-Day, the largest amphibious operation in history.

In a real sense, the invasion for the Seabees began in a bathtub in Virginia in 1939 when Commander John Laycock, CEC, USN, assembled cigar boxes and conceived unique pontoons, the stepping stones for the invasion of Normandy. As a result, the pontoon element, a 5-foot-by-5-foot-by-7-foot steel box pontoon, was developed at the Naval Construction Battalion Depot, Davisville, R.I., in 1943.

These pontoons, when joined together into a string of seven or more, with longitudinal corner assembly angles and locked by wedge bolts, formed a basic pontoon unit. When joined with similar assemblies they could form a barge, a tug, a landing ramp, a causeway or many other elements needed in beach operations.

More than 22,000 pontoons, produced at Davisville and shipped to England in 1943-44, were assembled into invasion units. Included were 37 rhino ferries, 37 rhino tugs, 56 causeway sections, 12 causeway tugs, 32 causeway blisters, 25 beetles and 57 miscellaneous elements. The 29th Naval Construction Battalion (NCB),

CAPT Palmer W. Roberts is a retired Civil Engineer Corps officer. This article first appeared in the Summer/Fall 1979 issue of the Navy Civil Engineer magazine, under the title D-Day, Europe, 1944.

The Seabees and D-Day

Fifty years ago, the Seabees played an important role in D-Day, the allied invasion of German-occupied Europe. The Seabees and their innovations were vital to the success of the largest amphibious operation in history as the allied forces stormed the shores of Normandy, France. These two articles, *D-Day: The Seabees were there!* and *The 108th Seabee Battalion: Can do, and did do, on D-Day*, examine their role in the invasion.

The photographs on pages 4, 6, 8, 10 and the inside back and front covers are courtesy of the CEC/Seabee Museum in Port Hueneme, Calif.

Landing ship tanks (LSTs) "dried out" at low tide, Utah beach, Normandy. The ships retracted from the beach at high tide.

Ramps are lowered and cargo is put on the beach.

Tanks debark from a rhino ferry onto the beach at Normandy.

the first Seabee unit to arrive in the United Kingdom, relieved the contractors of the construction of U.S. naval bases. The 13th Naval Construction Regiment was formed on Sept. 24, 1943, for the administration and logistic support for the NCBs in the United Kingdom.

In mid-December 1943, the 1006th NCB Detachment (possibly the forerunner of the amphibious construction battalion) arrived from the Mediterranean theater. This unit, having assembled and operated pontoon causeways in the invasion of Sicily and Salerno, Italy, was well-versed in the many pontoon problems. The 25th Naval Construction Regiment (NCR) was the largest Seabee organization (nearly 6,000) to participate in the invasion.

Ships and invasion elements departing from the United Kingdom moved toward the converging area, called Piccadilly Circus, the hub where all naval ships and craft assembled. The craft then proceeded through lanes, cleared by mine sweepers, to the five Normandy Beaches—Utah, Omaha, Gold, Juno and Sword.

The east shore of the Normandy peninsula had been under heavy aerial attack by Allied bombers. Naval batteries began shelling the beachheads and emplacements immediately to the rear of the beaches and bluffs above.

Landings on the beaches were made almost simultaneously at Utah and Omaha by U.S. forces and by British and Canadian forces at the three beaches to the east—Gold, Juno and Sword.

Strong winds and high waves created dangerous conditions at Omaha beach. At Utah, choppy waters made landings difficult. Utah offered flat terrain while Omaha was backed by bluffs and sheer cliffs up to 170 feet high. Heavy anti-invasion defenses had been installed by the Germans at Omaha.

Within an hour after the second wave landed at Utah, the beach was clear. At Omaha, the beach was thickly sown with mines, with three rows of tetrahedrons, hedgehogs and tangles of barbed wire to snag and damage invading landing craft. On top of the cliffs guns, strong batteries protected by concrete emplacements, commanded the whole beach expanse. Omaha was a giant trap, ready and waiting.

The first LSTs towing five rhino ferries, operated by the 111th NCB, arrived off Omaha at 0530 on June 6. The rhinos were cast off and each proceeded to marry its designated LST under difficult wave conditions.

The rhinos proceeded to the beach but were held off until beach obstacles were removed. Rhinos engaged in early landings were damaged by mine explosions and subjected to gunfire from enemy shore installations.

During this period, 20 rhinos were employed at Omaha, delivering 14,749 vehicles and 33,091 tons to the beach! Causeways were delivered on June 7 and positioned on June 9.

Mulberry elements arrived off of

Gooseberrie, rhinos and beetles?

The versatility of the box pontoon, similar to children's building blocks and their imaginative use, led to Seabee construction of many invasion instruments: ferries, tugs, causeways, breakwaters and even drydocks. The British penchant for code names and acronyms was adapted by the Americans. The terminology used in the text includes:

Rhino ferries. A grouping of pontoons into self-propelled or towed lighters or barges. A typical Seabee rhino ferry was 42 feet wide and 176 feet long and could accommodate 30 to 40 vehicles, plus personnel and their gear on the deck space.

Rhino tugs. Power auxiliaries constructed of the basic pontoon and equipped with outboard motors for general utility use.

Gooseberries. A line of scuttled ships to create artificial harbors for smaller craft.

Phoenix. Concrete caissons towed to location sites and flooded to form permanent barriers as breakwaters for artificial harbors.

Mulberry. A great artificial harbor created for Omaha beach. It encompassed use of gooseberries, phoenixes and **bombardons** (steel fabricated floating breakwaters).

Whales. Steel truss multi-span bridge installations serving as piers.

Beetles. Supporting floats of the whale bridge created from the versatile pontoon.

The first Seabee camp on the Normandy beach.

Troops and equipment load aboard a Seabee rhino ferry from a landing ship tank (LST) at Normandy.

the beach on June 7, and 14 gooseberries and 35 phoenixes were sunk on the two fathom line, forming a gibraltar. Headquarters 25th NCR, then afloat, were established on June 16 at a farm house behind Omaha beach.

The first LSTs towing four rhinos arrived early on June 6 in rough seas, completing marriage to other LSTs for unloading. Six more rhinos began operations on June 7. Between June 6 - June 18, *4,307 vehicles and 50,000 tons of bulk cargo* were delivered in 175 trips made by rhino ferries. All were subjected to heavy enemy fire from the beach.

One tug was sunk by enemy dive bombing, resulting in 12 Seabee casualties. The tugs handled 33 percent of all vehicles unloaded on the beach. A rhino repair barge arrived off the beach on June 7 and began servicing rhino units and other craft.

The pontoon causeways were delivered off the beach on June 7 and a detachment of the 1006th quickly installed two causeways, each two pontoons wide and 2,250 feet long. The camp construction detail of the 81st NCB arrived on June 9 and constructed shelter sufficient to accommodate 1,500 men and 70 officers.

On the morning of June 19 a northeasterly wind arose, the velocity steadily increasing from 10 to 30 knots, necessitating the abandonment of all unloading operations on both Omaha and Utah beaches. Small craft were cast well up on the beach or on the causeways. Gooseberries at both beaches were moved out of line or had their backs broken by wave action.

At Omaha, larger landing craft of all types collided with bridge units, causing extensive damage. Nineteen of the phoenixes, cracked and crumbled, and bombardons, cast loose from their moorings, crashed against the outer harbor elements. The rhinos, although effective in rough seas, were thrown on the beach when the wind increased to 35 knots and with wave action up to 10 feet.

The storm subsided on June 22. Limited unloading was begun on both beaches, which were cluttered with debris and craft of all descriptions. Working parties were organized to inventory damage, to clean up the beaches and salvage operative units. Approximately 500 craft were countered scattered on the beaches.

By June 22, the beach was sufficiently cleared to allow LSTs to dry out and unload. Seven rhinos were in service with the remaining awaiting replacement engines from the U.K. Both causeways were in operation by June 23, unloading troops and cargo from LCMs and LCTs.

Seabees and the Civil Engineer Corps were recognized elements in the success of D-Day, the largest amphibious operation in history.

More than 15,500 personnel, 3,300 vehicles and 12,000 tons of bulk cargo were landed over the beach on June 24, a remarkable recovery and surely a great credit to the ingenuity and resourcefulness of the Seabees involved.

As a direct result of enemy action during the invasion, the Seabees of the 25th NCR suffered 21 dead, three missing, 61 wounded and 10 injured. An additional 45 men were incapacitated through injuries not attributed to the enemy but from other sources, such as ship and shore accidents.

Following the invasion and storm recovery period, Seabee activity on the beaches primarily consisted of the operation and maintenance of rhino ferries and tugs, causeways and beach camps. Such activity was conducted around the clock with rhino crews standing 48-hour on and off watches. Small crew accommodations were provided on each unit for this purpose.

The landings on the beaches of Normandy did not conclude the Civil Engineer Corps and Seabee operations in the European theater of war. Following the successful assault, the Corps and Seabees were engaged in port restoration and maintenance throughout the channel area.

And later, Seabees were among the first in the successful crossing on the Rhine River, which brought the war to Germany's homeland and a rapid conclusion to the war.

Official recognition of the 25th NCR's participation in the D-Day landings was expressed in late 1944 by Admiral Harold R. Stark, USN, then Commander, U.S. Naval Forces, Europe, and later Chief of Naval Operations:

"The activities of the 25th Naval Construction Regiment were efficiently carried out under more than ordinary handicaps, such as late start, changes in plans, necessity of developing new methods of operation while a large construction program was in progress, adverse weather and enemy opposition during the early days following the landings on the coast of France. The leadership, skill, and craftsmanship of the regimental and battalion commanders and officers attached was of the highest order, and it was chiefly through these characteristics that so many and so wide a variety of assignments were carried out successfully. The work of the 25th Regiment contributed materially to the success of the landings and build-up of troops, supplies and equipment for the U.S. Armies in France." ❑

Four-pontoon causeway, 28 feet wide, laid at Utah beach by Seabees of the 1006th Construction Brigade Detachment. Photo taken before the storm of June 19-22.

One of a number of pontoon causeways in the U.S. mulberry at Omaha beach near Collesville, France.

One of the innovations which distinguished the artificial floating harbor "mulberry" set up off Normandy in the invasion was the mobile repair "ship" set up on a large pontoon section.

The 108th Seabee Battalion: Can do, and did do, on D-Day

By JOC J. Wandres, USNR-R

The story of the Allied liberation of Europe, which began with the invasion at Normandy, France, on June 6, 1944, has been well told, and was well told again during the 50th anniversary commemoration of D-day in June 1994.

Less well told is the story of the work done by the Seabees, notably the 97th Naval Construction Battalion, to support the build up of troops and supplies that stoked the invasion forces. Virtually forgotten is the job well done by one element of the 97th: the 108th Naval Construction Battalion (NCB).

The 97th NCB was formed in June 1943. Many of its men were drawn from the Southwest and manufacturing centers such as Chicago, Ill.; Gary, Ind.; and St. Louis, Mo. Some members were family men, in their 30s and 40s, and had much experience in construction. And then there were "kids," like 20-year old Ray Dierkes of St. Louis: with some experience as a plumber and eager to join "the fighting Seabees."

The 97th did its basic training at Camp Peary near Williamsburg, Va., and advanced training at Naval Construction Depot Davisville, R.I. After arriving in the United Kingdom in September 1943, one half of the battalion remained in Ireland, the other was sent to Scotland, where it helped to build and maintain a supply base at Roseneath, near Glasgow.

JOC J. Wandres is affiliated with the Naval Reserve Navy Office of Information East, Detachment 102, New York City. As a civilian, he is a professional freelance writer and a student of naval history.

Blood on the walls

The Yanks and Scotties worked well alongside one another, even if a drawling Seabee from southern Missouri had trouble understanding the broad brogue of a highland Scot. While at Roseneath, in February 1944, Company C of the 97th was split off, recommissioned the 108th NCB under Lieutenant Commander Erwin Collier, CEC, USNR, and was sent south to Plymouth, on England's south coast, where the battalion helped to build a mammoth supply base.

With the job completed, the battalion deployed east, to Southampton, to renovate the Queen Victoria Hospital, overlooking Southampton Water, at Netley. The long-vacant hospital was in disrepair when it was turned over to the Americans, to become their main trauma hospital for battlefield casualties.

Albert Carr was among the group who helped to renovate the 3,000-bed hospital. "I can still see the mess everywhere, even dried blood spattered on the walls of the operating rooms," he recalls. Seabees drove jeeps up and down the four-block long hallways, as they delivered supplies and removed rubble. They patched the roof, replaced windows, installed wiring and plumbing, and repainted the wards and operating rooms.

Later, Carr was assigned to the transportation pool, to deliver plasma to the hospital, collected from blood donor stations all over the United Kingdom. "I had a pass that let me go anywhere, stay anywhere," he says. Some of the blood drivers unofficially transported another valuable commodity: soda from the Red Cross and PXs.

A 24-man detachment of the 108th was sent, under secret orders, to Tilbury, a village on the Thames River 25 miles east of London. Their mission: help the Royal Engineers build two of the 130 giant, reinforced concrete structures code named "phoenix." These caissons would form a breakwater for the "mulberry" harbors off the invasion beaches. The caissons, and the floating, semi-submersible pier heads called "Lobnitz piers," and causeways called "whales," were to be towed across the English Channel, and assembled in the shallow Bay of the Seine to create a protected anchorage.

Dog tags in the garden

The phoenix caissons were fabricated in drydocks in Southampton, Portsmouth and London. The largest

Invasion craft high and dry on the Normandy beach after the storm of June 19-22.

Seabee in action at Normandy.

A pontoon causeway.

caissons weighed 60,000 tons and were as big as a five-story tenement building lying on its side. As soon as the concrete had cured, the caissons were floated then towed, with their crews on board, to staging areas off the south coast. Army gun crews trained using the 40 mm BoFors anti-aircraft gun, while the Seabees trained on the scuttling valves. "Living quarters" on the caissons didn't exist. The Seabees had rigged shelter halves at the bow, and cooked on gasoline stoves.

Many of the phoenix caissons were staged in shallow water near Selsey Bill (headland); their flooding valves were opened, and the caissons settled to the bottom, ready to be pumped and refloated in time for the invasion. In Selsey, the 108th NCB established a base camp, in vacant fields and a former summer camp ground. Lieutenant Fred Barton, USNR, set up headquarters in the tower of Bill House, a former resort inn, from which he directed the training and resupply of the phoenix crews.

Bob Holcombe, a current Selsey resident interested in the Americans' presence in his town during World War II, says the military camp was off limits to residents. Well, maybe not totally off limits. Young ladies of the British Red Cross Youth Auxiliary baked donuts for the GIs. And the Seabees reciprocated by showing the young women how to repair and drive the strange, left-drive Jeeps.

A mystery that intrigues Holcombe, secretary of the Selsey Historical Society, is nearly 100 U.S. military dog tags were recently dug up from the garden of a World War II-era house called Brisa. The house, on Park Lane near where the Seabees had set up camp, was used by American officers.

Isle of Wight

Another detachment from the 108 NCB, including Ray Dierkes, set up a base on the Isle of Wight. Here, in the shallow waters off Peel Bank, they practiced working the complex machinery of the Lobnitz piers. Their 60-foot "spud" legs were designed to be lowered to the uneven floor of the Bay of the Seine off the Normandy beaches. Once in place, the pier crew used the pier's diesel engine hoists to raise and lower the pier platform to match the tides. Connected to the piers were whale bridge causeways, which floated on concrete "beetle" pontoons.

The encampment of the 108th battalion, at Selsey, England, was supposed to be off-limits to civilians. However, this group of Seabees found time to show the members of the British Red Cross Girls' Auxiliary how to repair and drive the strange, left-drive jeeps.

Siting and sinking the Lobnitz piers was difficult, even in practice. Then, a few weeks before the planned invasion, mulberry officers got some bad news. They discovered that when landing ships pulled up to the Lobnitz piers, they could not open their bow doors to off-load. With no time to redesign the pier heads, the landing ships' bow doors were modified—with an oxyacetlene torch. A new type of access ramp, called an "Olson ramp," after the name of its inventor, helped vehicles climb from the bow ramp up onto the piers.

And then the invasion was on. Ray Dierkes can still remember it like it happened last week. On the night of June 5, having been towed across the English Channel, he and the crew huddled on the deck of Lobnitz Pier 406, lying about two miles off the French coast.

"None of us slept that night. At four a.m. the battleship *Texas* and other ships blasted the French coast. The sky lit up like the Fourth of July, only greater. I never saw such a mass of ships! At dawn, we looked up and saw all those planes and gliders going over."

While other crews from the 108th NCB were placing and sinking the phoenix breakwater caissons, the Lobnitz pier crews stayed outside the range of the German coastal guns. Then, on June 8, a tug towed them to their assigned place inside the breakwater.

"It was like a giant jigsaw puzzle. We had to wait until the whale bridges were in place, from the beach out, before we could hook them up to the piers. All that time we were exposed to the German guns and the Luftwaffe," Dierkes remembers.

With their piers anchored to the bottom of the bay, and connected to each other and to the causeways, the offloading could commence. LST 543

Continued on page 32

Microtunneling boring head used by the Nova Group, Inc. on the sewer line in Pearl Harbor, Hawaii. (Photo courtesy of Nova Group, Inc.)

Trenchless excavation technologies: Consider the possibilities

By LT Scott K. Higgins, CEC, USN, P.E.

The trenchless excavation technology is BOOMING! Cities and companies are avoiding mazes of existing utilities and busy roads by fixing and installing underground utility lines without digging trenches.

Trenchless technologies fall into two major categories: repair of existing buried utility pipelines and horizontal earth boring. Consider the possibilities of what trenchless technologies can do for Navy facility engineers:

- Reline sewer lines without interrupting service, instead of enlarging waste water treatment facilities to handle ground water infiltration
- Place new pipes without interrupting traffic, instead of enlarging waste water treatment facilities to handle ground water infiltration
- Place pipe under layers of contaminated soil and minimize spoils

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LT Scott K. Higgins was a graduate student in the Construction Engineering and Management Department at Purdue University in West Lafayette, Ind., when he wrote this article. He is currently the aide to the Commander, Atlantic Division, Naval Facilities Engineering Command in Norfolk, Va. Credit for this article should also be given to Professor Lloyd Jones, who is a retired lieutenant commander in the Civil Engineer Corps.

• Virtually eliminate groundwater drawdown and dewatering

• Place pipelines in soil as deep as 100 feet below grade

• Place pipes below rivers, streets, buildings or other structures without trenching

These technologies are much more than the familiar horizontal boring or pipe grouting previously used on naval facilities. In addition, they include microtunneling, directional boring, pipe bursting and pipe jacking.

Since trenchless technologies haven't seen widespread use on Navy bases or in Naval Facilities Engineering Command contracting, several misconceptions exist about them.

Misconception Number 1:

Trenchless technologies haven't matured enough for government use.

Trenchless technologies have been around for many years. Microtunneling, which was first developed by Japanese and German manufacturers, evolved out of the large shielded tunneling technologies. Systems using earth pressure balancing cutting faces have been on the market since the 1970s. Since then, thousands of miles of tunnels have been excavated.

Misconception Number 2:

Specifying the use of trenchless technologies is proprietary.

Certainly, specifying *equipment* to perform the work may be proprietary. However, using a specification that allows for—or even requires—the use of trenchless alternatives should pass restrictions in the Federal Acquisition Regulations. There are many manufacturers and contractors who can provide services such as microtunneling, pipe jacking and pipe bursting. *Many different methods and materials are available.*

Misconception Number 3:

Projects that use trenchless technologies will cost considerably more than traditional methods.

Trenching will generally be less expensive for straightforward new pipe installation projects. Trenchless technologies become attractive when complications exist. They become helpful when utility lines need to be placed in:

• Pipe runs greater than 150 feet at depths greater than 6 feet below grade

• Groundwater tables near the surface or concerns about subsidence in the adjacent road or buildings

Definitions

Microtunneling. Microtunneling horizontal earth boring is a process characterized as a highly sophisticated, laser guided, remote controlled system providing the capability of continuous accurate monitoring and control of the alignment and grade.

Directional drilling. A process that utilizes a specially built drill rig that thrusts the drill stem through the ground while bentonite drill mud operates a down hole motor, functions as a coolant and facilitates spoil removal by washing the cuttings to the surface to settle out in a retention pit. The path of the borehole is monitored by a down hole survey system that provides data on inclination, orientation and azimuth of the leading end. Direction is controlled by a bent housing used to create a steering bias.

Pipe jacking. Differentiated from microtunneling horizontal earth boring by requiring the necessity of workers being inside the pipe during the excavation and/or spoil removal process. Prefabricated concrete, steel or fiberglass pipe may be utilized as the jacking pipe. The excavation process varies from manual to highly sophisticated tunneling boring machines.

Utility tunneling. Utility tunneling is differentiated from the major tunneling industry by virtue of their size and use (such as conduits for utilities rather than as passageways for pedestrian and/or vehicular traffic). Further, while the excavation methods for utility tunneling and pipe jacking may be identical, the differentiation is in the lining systems, with the most popular being steel tunnel liner plates, steel ribs with wood lagging and wood box tunneling.

(The definitions are adapted from the National Utility Contractors Association's *Trenchless Excavation Construction Equipment and Methods Manual.*)

• Contaminated soil or ground water (Spoils are limited to the material displaced by the pipe and around manholes.)

• Pipe sizes larger than 18 inches and smaller than 72 inches

• Rock or varied soil conditions

• Areas of high personnel danger (confined spaces, trench wall collapse or cross buried utilities)

• Areas with numerous cross buried utilities (Microtunneling or directional boring can go beneath them.)

• Areas with a need for extreme grade control (Microtunneling can be laser guided and can provide alignment control within tolerances of 1 to 2 inches in several hundred feet of boring.)

• Areas with traffic or operations that cannot be disrupted by open excavations

The additional costs related to these complications can quickly make trenchless technologies a competitive option.

Misconception Number 4:

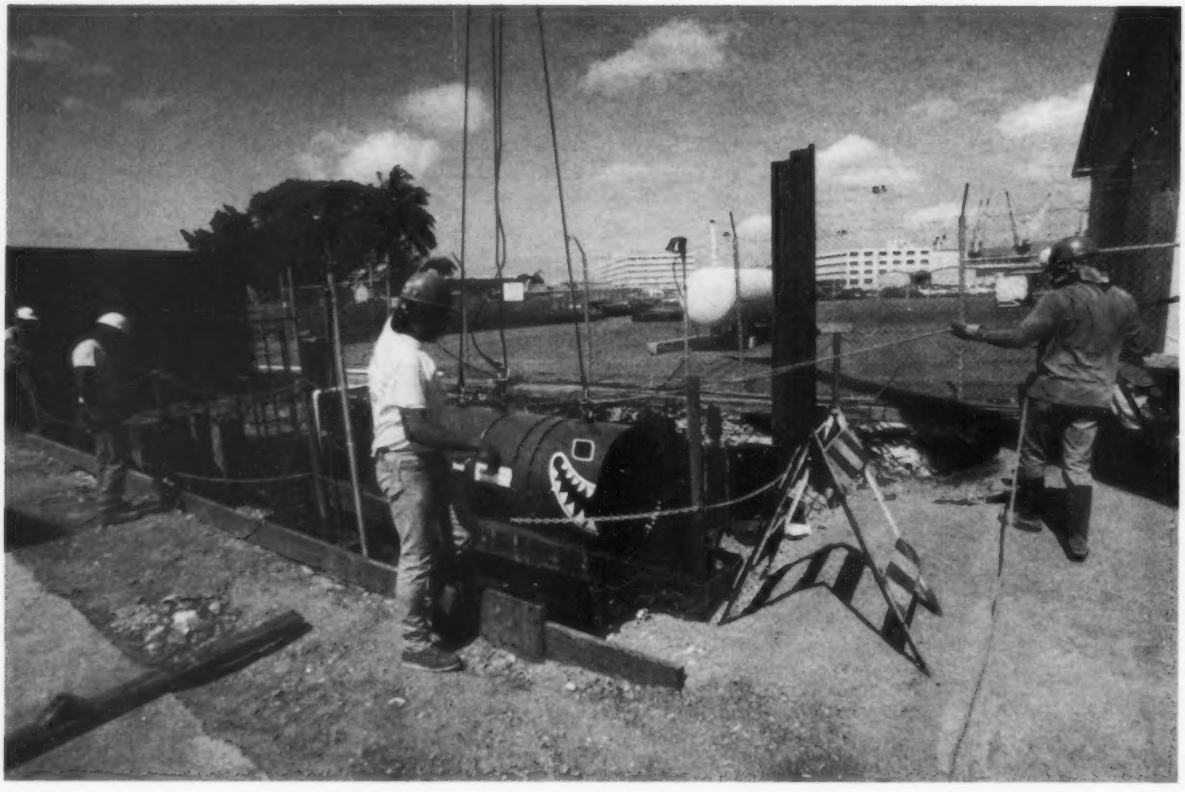
Trenchless technology alternatives aren't being used by major customers or owners.

Many large projects have been successfully performed for cities such as Seattle, Wash.; Houston, Texas; and Boston, Mass. The Army Corps of Engineers Waterways Experiment Station in Vicksburg, Miss., is working with the Trenchless Technology Center at Louisiana Tech University to test the capabilities of several different trenchless methods.

Recent Navy project

A deep gravity sewer line was recently installed at Pearl Harbor, Hawaii, using microtunneling. The replacement sewer line was originally designed to be a 24-inch clay tile pipe, more than 1,000 feet long and buried at depths of approximately 20 feet below grade. The pipe was to be buried beneath a major road, in soils consisting of clay, coral and fill. The groundwater table was approxi-

The boring head is lowered into a driving pit in preparation for tunneling. (Photo courtesy of Nova Group, Inc.)



mately six feet beneath the road.

The first manhole and 50 feet of pipe were installed and backfilled. During inspection of the work, a collapsed pipe and joint failure were discovered. Petroleum-contaminated groundwater and soil were found when the trench was excavated. Disposal of the contaminated soil, soil testing and handling were major concerns.

The contractor, Nova Group, Inc., proposed several trenchless alternatives for installing the new pipe, and the decision was made to use microtunneling to install the new pipe. After the contract was modified, the contractor installed a 38 inch steel casing with a laser-guided earth pressure balanced machine. The machine bored beneath the contaminated zone and significantly reduced the soil and water disposal problem.

The microtunneling machine's cutting head was hydraulically jacked horizontally. A string of steel casing pipe followed the cutting head. Tunnels were bored between manholes, and oversized manhole excavations were used as launching pits for the microtunneling machine. Cuttings were pumped in a slurry suspension back through the tunnel to a settling basin.

After the tunnels were finished, a polyvinyl chloride (PVC) carrier pipe was placed inside the 38 inch casing pipe. The annulus between the casing and the carrier pipe was filled with a light weight concrete. The final grade of the pipe was extremely accurate and the new line reportedly reduced groundwater infiltration significantly.

Nova Group, Inc., and the Resident Officer in Charge of Construction Pearl Harbor were recognized by the Hawaii Section of the American Society of Civil Engineers for their efforts on this project. They were presented with a Merit Award for Outstanding Engineering Achievement.

•••

Trenchless excavation construction methods may be added to contracts through modification or specified in the basic contract. A draft microtunneling guide specification has been submitted for NAVFAC review and possible inclusion into the Construction Criteria Base.

Trenchless excavation methods may be the only alternative for complicated conditions. Don't overlook these possibilities! ❑

Do you want to know more about trenchless technologies?

For additional information about trenchless technologies, write:

Trenchless Technology Center
Civil Engineering Department
Louisiana Tech University
Ruston, La. 71272-0046

Draft NAVFAC Guide Specification for Microtunneling
are available from LT Higgins:
c/o Commander, Atlantic Division,
Naval Facilities Engineering Command
1510 Gilbert Street
Norfolk, Va. 23511-2699

Trenchless Excavation Construction Equipment and Methods Manual
is available from:
National Utility Contractors Association
4301 N. Fairfax Drive, Suite 360
Arlington, Va. 22203-1627

Travel the information super highway with the PWC Norfolk Information Resources Center

By George F. Little
Kenneth Megill, Ph.D.

The Navy Public Works Center, Norfolk, Va., has maximized the electronic bibliographic resources of the information age. PWC Norfolk has implemented an Information Resources Center providing information retrieval and research services to PWC managers and professional and technical staffs.

The PWC Norfolk Information Resources Center is a computer-assisted operation with access to millions of records contained in more than 430 on-line commercial data bases, government data bases, CD-ROMs, specialized electronic bulletin boards and Internet. These data bases represent the most extensive collection of technical reports, journal abstracts, bibliographies, corporate directories, government data bases and other information services available worldwide.

Many of the records contain the complete text of journals, newspaper articles and current news releases. Other records are retrieved as a summary statement of contents (abstracts) and can be obtained in their entirety by PWC information specialists who have on-line access to document delivery services. The data base includes publications of the Institute of Electrical Engineers, the National Technical Information Service, Engineering Information, Inc., the Environmental Studies Institute, the U.S. Department of Commerce, the Environmental Protection Agency, the Welding Institute and the U.S. Library of Congress. *Commerce Business Daily* and the *Federal Register* are also included in the data base.

Examples of recent information retrieval services performed by the Information Resources Center include:

- Providing engineering professionals research and applications information on steam pipe systems design and new motor rewinding techniques

- Providing managers information on national, regional and state policies concerning the establishment of water rates, benchmarking, re-engineering and competency based training

- Providing labor relations specialists with legal, environmental and health information on asbestos

The Information Resources Center is staffed

George F. Little is a management analyst at Public Works Center, Norfolk, Va. He is a Public Works Management Development Program candidate. He has recently completed course requirements for a master's degree in Library and Information Science with a concentration in information resources management. Kenneth Megill, Ph.D., is director of the Information Resources Management Program, School of Library and Information Science, The Catholic University of America, Washington, D.C.

by management department management analysts and industrial engineers, more than half of whom have completed graduate programs in information science, planning and administration, business administration and engineering management. Close professional ties are maintained with local technical, legal and academic libraries as well as the Catholic University School of Library and Information Science. PWC Information Resources Center information specialists are available to assist you in:

- Monitoring the latest research and development efforts in any field
- Investigating products or services
- Monitoring or tracking federal legislation
- Gathering supporting information for briefings
- Preparing for litigation
- Tracking latest trends in management science and practices

In addition to the electronic services listed above, PWC information specialists also:

- Locate specialized information on print and other media.
- Evaluate new information service technologies and resources
- Provide consultation to commands desiring to establish their own Information Resources Center

Response time to an initial uncomplicated electronic information search request is within 24 hours. Request results, including abstracts, are transmitted to the requester via fax or MILNET/ Internet. Full text documents are available upon request.

To obtain additional information concerning these services, write George Little, Code 130, Navy Public Works Center, 9742 Maryland Avenue, Norfolk, Va., 23511-3096. He may also be reached by telephone on DSN 565-4805/2770 or commercial (804) 445-4805/2770; Fax (804) 445-9747; or Internet <<pwcnva@infi.net>>. ❑

Art by Bill Brack

Introducing the 24-hour "Blik"...

The long road to metrication

By Michael M. Hunter, P.E.
CDR D. Scott Bianchi, P.E., CEC, USN
Michael M. Blank, Ph.D., P.E.
Otto F. Schick

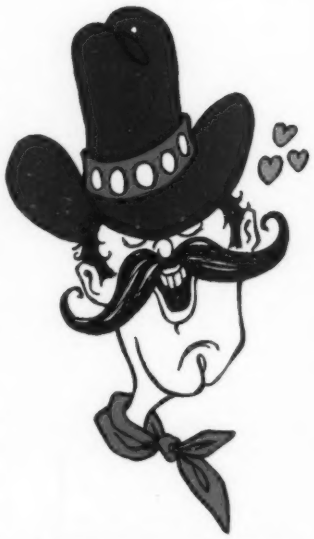
Art by Bill Brack

The French Revolution spawned a host of fundamental, enduring changes. Rightly known for its violence, condemned by Edmund Burke and other thoughtful men of the day, this event gained a terrible image that it didn't entirely deserve. For all its excesses and outright horrors, it loosed a frenzy of creativity and free-thinking not often seen in any epoch. It fostered new ideas in philosophy and politics. And to science and technology, it gave perhaps the most useful tool of all. The worldwide technique of measurement known today as the metric system was born of the chaos, tragedy and genius of the French Revolution and its aftermath.

Despite its logical basis, the new system got off to a slow start. Older ways, though cumbersome, were familiar to generations of tradesmen, merchants and scientists reluctant to give up something they knew so well. And Great Britain, followed by the other English-speaking countries, declined to adopt the new system. But gradually, the simplicity of the decimal-based technique, relying on the unchanging dimensions of the earth and on the properties of things as common as water, convinced more and more nations to convert. By the end of the 19th century, 35 nations had officially adopted the system, and many others were using it to meet the demands for better precision in science.

Surprisingly, the infant American nation almost went metric from the beginning. Influential men, among them Thomas Jefferson and John Quincy Adams, studied the system carefully but did not recommend its adoption because essential measurements could be made only in Europe. Jefferson did recommend a decimal-based system to Congress, but legislators, unable to make up their minds, took no official action. Not until the second half of the 19th century did the country move toward adoption of metric standards. And even then, the first steps were tentative.

Use of the metric system became legal in 1866, a move that cleared the way for American representatives to participate in the first Diplomatic Conference on the Meter in 1875. Fol-



Notorious cowpoke Harlan just loves his 37.85 liter hat

Michael M. Hunter is the head of the Energy and Environmental Branch at the Naval Air Warfare Center, Aircraft Division in Warminster, Pa. CDR D. Scott Bianchi is the public works officer and Michael M. Blank, is a project manager in Facility Management Division at NAWCAD Warminster. Otto F. Schick is a mechanical engineer in the Design and Construction Department of the General Services Administration in Philadelphia, Pa.

Accountant Bob is penny wise but 0.45 kilogram foolish

lowing the Conference, the United States became one of the original 17 nations that adopted the Convention of the Meter. Still, progress in converting was fitful. Compliance with the Convention remained voluntary, and the whole country seemed resistant to change. That resistance has continued for more than 100 years, slowing our transition to the standard that the rest of the world uses.

Crazy quilt system in use

We have paid a price for our languor. While scientists use the metric system almost exclusively, engineers are caught up in a crazy quilt routine that uses parts of both English and metric standards. And businesses trying to sell at home and abroad find they too must deal with both systems. To give just one example, engineers in Pennsylvania must fill out a monthly report form on the operation of sewage treatment plants. The form asks for concentrations of contaminants in milligrams per liter. It also asks for total loading, which is simply the product of a concentration and the flow rate. The loading, however, must be reported in pounds, not kilograms, per day. So the engineer must resort to using a conversion factor, yielding an equation that looks like this:

$$W = 8.34\ (Q)\ (C)$$

where W = total loading, in pounds per day
Q = flow rate, in millions of gallons per day
C = contaminant concentration, in milligrams per liter

A calculation to give an answer in metric would, of course, be quite simple, with nothing more required than placing the correct number of zeros before multiplying.

On the road to metrication

Although we continue to hold to our peculiar ways, we Americans are beginning to make progress on the road to metrication. Children now learn the metric system in their first years of school. Car speedometers have both metric and English scales, and in some parts of the country, especially those popular with foreign tourists, highway signs give distances in both miles and kilometers. Export-oriented companies find that they must use metric standards to sell their products overseas. But despite these gains, we have a long way to go.

We committed ourselves to adopt the metric system long ago, but we have taken a gradual approach to conversion. In some ways this idea has made good sense. Conversion is expensive, and spreading the change over many years softens the effect and makes the costs more manageable. Still, for a country like ours, known for its fixation on change and getting things done in a hurry, the transition has been remarkably slow. ❑

Henderson's back 0.9 meter gets out of hand every summer

How does NAVFAC measure up in metric conversion?

By David J. Skar, P.E.

Legislation passed by Congress and signed by the President designated the metric system of weights and measures as the preferred system for United States trade and commerce.* These acts, combined with a July 1991 Executive Order (which directed agency heads to use the metric system in federal government procurement), assigned federal procurement a unique role.

Federal procurement would help establish a "guaranteed" market for metric products to assist American industry while it gears up to become more internationally competitive in the metric system. As a result, several agencies initiated pilot metric construction projects.

The Naval Facilities Engineering Command (NAVFAC) has been monitoring metrication results of other federal agencies and preparing metric reference material. Ninety percent of NAVFAC's guide specifications have been converted to metric, and planning and design manuals are being adapted. The National Institute of Building Sciences studied seven ongoing federal agency design and construction metric projects. The analysis found that:

- Within weeks on a metric project, designers developed a level of comfort with metric system.
- The contractor's work force tended to convert metric to the more comfortable inch-pound system.
- Commercially available metric sized products (5 percent to 10 percent of the products in a building) had a cost premium of typically 1 percent to 3 percent. This small premium for relatively few new products has a negligible impact on total building cost when compared with the impact of market conditions.
- Metric maintenance policies needed to be developed.

Many agencies, impressed by the success of the pilot projects, have announced their metric design and construction implementation plans. As of January 1994, all new design work for the Army Corps of Engineers will be in metric to the extent economically and technically feasible. The current Pentagon renovation is being designed and constructed in metric. The Air Force has asked its major commands to consider all FY 96 projects for metric design. The General Services Administration, a leader with its pilot projects, is using metric for its design work as of January 1994. The Federal Highway Administration will require that all federal and federal-aided highway construction be built in metric after Sept. 30, 1996. NASA is designing all FY 96 projects in metric unless there is an overwhelming reason against it. The Department of Veterans Affairs is using metric on selected projects.

All FY 97 new, replacement and improvement housing projects will be designed in metric.

NAVFAC metric status

In June 1994, NAVFAC adopted a recommendation from the MILCON Acquisition Process Improvement Team to design and build FY 97 construction projects with metric dimensions. Engineering field divisions (EFDs) and engineering field activities (EFAs) have been requested to include the metric requirement in their *Commerce Business Daily* design announcements for the FY 97 Military Construction, Navy (MCON) and Base Realignment and Closure (BRAC) programs.

EFDs and EFAs were asked to submit project engineering phase documentation in metric. In addition, all FY 97 new, replacement and improvement housing projects will be designed in metric. The NAVFAC headquarters Planning and Engineering Support Directorate will provide oversight and guidance as the construction programs transition to metric. ❑

*The Metric Conversion Act of 1975, as amended by the Omnibus Trade and Competitiveness Act of 1988, designated metric weights and measures as the preferred system for the United States. Executive Order 12770 of July 25, 1991, directed agency heads to use the metric system in federal government procurement to the extent economically feasible.

David J. Skar is an engineer in the Planning and Engineering Support Directorate at the Naval Facilities Engineering Command Headquarters in Alexandria, Va.

Steam plant moves to its new home at PWC Norfolk

By Charles R. Senerius
John Mintz
Vickie Marino
Arthur McElroy

The Government Services Administration (GSA) acquired the South Boston Steam Plant Power Station Facility from the Massachusetts Bay Transportation Authority in Boston, Mass., for the Navy Public Works Center Norfolk, Va. Once the steam plant comes on line in May 1995 in Norfolk, it will be used to generate 450,000 pounds of steam per hour, which will be used by the ships and buildings for heating and hotel services. Building construction and installation of the steam plant began in the fall of 1992.

The Massachusetts Bay Transportation Authority completed 90 percent construction completion on three 150,000 pounds per hour boilers and auxiliary equipment when the steam plant project was stopped in 1979. The equipment was turned over to GSA by the Department of Transportation, which funded the project. The then-Navy Energy and Environmental Support Activity in Port Hueneme, Calif., spotted the equipment in the GSA disposal equipment listing inventory and asked PWC Norfolk if the Norfolk naval station could use the steam generating equipment. PWC determined the equipment was compatible with the existing steam system, and plans were made to acquire the plant for the base.

Charles R. Senerius is the traffic manager in the shore installation management division at the Naval Facilities Engineering Command in Alexandria, Va. John Mintz is the steam production division director at the Navy Public Works Center Norfolk, Va. Vickie Marino is a mechanical engineer at the Navy Public Works Center, Norfolk, Va.. Arthur McElroy is a traffic management specialist at the Military Traffic Management Command in Falls Church, Va.

The partial dismantling of the steam plant building, including restoration, and transportation to complete the relocation project was approximately $600,000. The steam plant consists of three boiler units weighing 231,000 pounds each (empty), 16,145 cubic feet each, 39 feet 2 inches in length by 17 feet 8 inches in width by 23 feet 4 inches in height. The auxiliary equipment for the steam plant includes economizers, dust collectors, breaching and miscellaneous equipment.

PWC Norfolk worked out the steam plant acquisition details involving liability and responsibility between the federal government and the city of Boston. The traffic department at the Naval Facilities Engineering Command headquarters and the Military Traffic Management Command in Falls Church, Va., handled the logistical details involving the complex move by water and truck transportation and, to some extent, the partial dismantling and restoration of the steam plant building.

Two tug and barge trips were needed to move the steam plant boilers and the large auxiliary equipment from South Boston to Norfolk, Va. Specifically designed equipment cradles and innovative engineering techniques were used by the contract transportation carrier to make the trips by water a "can do" success. This article examines the equipment and techniques used.

•••

Boston site preparation for the move

On June 13, 1991, the Military Traffic Management Command, Falls Church, Va., awarded the movement of the steam plant boilers and auxiliary equipment to Peloso, Inc., of Johnson, R.I. On June 17, Peloso, Inc. set up a field office at the steam plant site and prepared to marshal subcontractors to commence work for the removal of the steam plant.

Steam plant is dismantled in Boston

On June 26, Hallimore Rigging of Holbrook, Mass., mobilized its men and specialized heavy hauler moving equipment at the steam plant and waterfront project locations. By the end of the first day the catwalks around the exterior of the building, a substantial portion of the structural steel form, and the first two sections of the breaching from the economizer were removed.

On June 27, Peloso Inc. shipped by truck the miscellaneous components for storage at Naval Supply Center, Cheatham Annex, Va. Concurrently, dismantling of the building continued. The large sections of breaching and economizers were loaded onto trailers and transported to the pier loading site. They were off loaded and pre-positioned for barge arrival and loading.

On July 8, one boiler was removed from the foundation. After the anchor bolts were burned off, the boiler was raised by hydraulic jacks high enough to slide layers of plywood strips coated with bar soap underneath the foundation pedestals. Timber sections were placed on the front of the boiler to act as temporary foundations. Rails were placed on each side of the boiler with a roller assembly. The boiler was then winched out using padeyes on the boiler base frame. The bar soap on the plywood allowed the boiler to easily slide along the rails. Once the boiler was winched to the edge of the timbers, the boiler would then slide out using the roller/rail conveyor system. The second and third boilers were then removed.

Over the next few days the old pier at the barge loading site was removed in preparation of the barge arrival. Auxiliary equipment was moved by truck to NSC Cheatham Annex for temporary storage.

Steam plant gets stuck while losing traction on landing ramp in Boston backing onto barge

The boilers were moved to the barge loading site using a specialized 96-wheel transporter trailer, towed by a 1200 horsepower tractor.

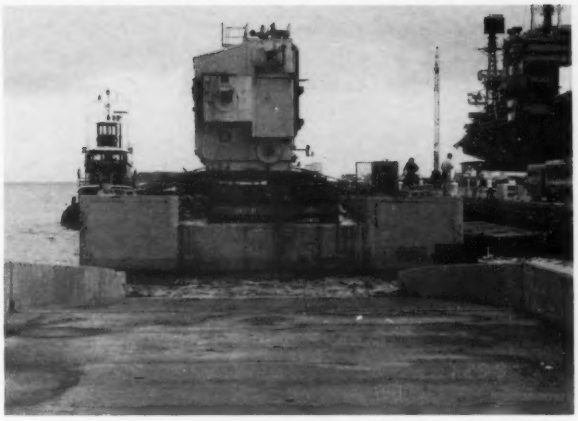
This special tractor was connected to a fifth wheel and a fully hydraulic self-leveling platform. The platform measured 34 inches high, weighed approximately 126,000 pounds, had 12 axles (eight wheels per axle) and possessed a cargo carrying capacity of 530 tons.

The specially built hydraulic trailers owned by Hallimore and Lockwood Brothers, Inc., of Hampton, Va., were designed to accept loads up to 530 tons. Depending on the weight and size of the shipping unit(s) to be moved, the hydraulic trailer transporters could be assembled into as many as seven combined sections to accommodate a variety of oversized/overweight shipments.

Three 52-foot, steel ramp sections were used to bridge the gaps between the barge and piers at Boston and Norfolk. The ramps weighed 16 tons each and were 6 feet wide.

The three boilers, three economizers, the steam header and two sections of breaching were loaded and secured in the pre-engineered/designed barge cradles. Lockwood Brothers had constructed and installed these special dunnage platforms. The platforms were welded to the barge's deck to secure the Navy cargo for the long voyage from Boston to Norfolk.

On July 23, after the equipment was secured, the barge pulled out.



Steam plant arrives at its new home in Norfolk

On July 26, the tug and barge arrived at the Naval Station pier 11 at 4 p.m.

On July 29, Lockwood Brothers mobilized their men and heavy hauler equipment and began offloading the economizers, steam header and breaching sections for movement to the storage site at the Norfolk naval station. The three boilers were then offloaded from the barge for movement to the storage site on the specialized 96-wheel transporter.

On August 19, the second barge was loaded and equipment secured. This load included the remaining breaching sections and three dust collectors. These units were delivered to the storage site in Norfolk. ❑

And don't forget...

Other team members participating in the move were Kurt Crist, Andrew Gallagher, Michael Slendy and William Boykin, all from Public Works Center, Norfolk, Va.

Have you considered the reserves?

If you are a young construction professional in civilian practice or civil service, or are a graduating engineering or architecture college senior who has already selected a career path, the reserve Civil Engineer Corps may have a place for you.

Qualified young professionals have the chance to achieve tremendous personal and professional satisfaction through:

- Direct appointment as an ensign, Civil Engineer Corps, United States Naval Reserve
- Challenging assignments within the reserve Naval Construction Force units in your geographic locale, in areas paralleling active duty in the Seabees or in facilities management
- Annual active duty training that is meaningful
- Development of leadership and technical skills that will carry over directly into your civilian profession
- A naval reserve retirement package for a little something extra in your old age

Here's what you can do...
If you are a young engineer or architect, please call or write the reserve representative listed below.

Commander Dale Walker, CEC, USN
Reserve Naval Construction Force
Support Command
5000 Marvin Shields Boulevard
Gulfport, MS 39501-5016

Phone: (601) 871-5090
DSN: 868-5090
1-800-782-3510

An active duty accessions officer listed on page 29 may also be contacted for information.

Excuse me sir, what are you?

By LCDR Robert P. Walden, CEC, USN

As the facilities planning officer at Commander, Submarine Force, U.S. Atlantic Fleet (COMSUBLANT), my primary duty was coordinating and tracking military construction projects with two key shore activities, Submarine Base New London, Conn., and Submarine Base Kings Bay, Ga. I was also assigned as the environmental assistant to the force civil engineer. I assisted in the development of afloat environmental policy for the Atlantic Fleet submarine force.

As the environmental assistant, I was often asked, "Excuse me sir, what are you?" as I traveled through the passageways of a nuclear submarine. My job as the environmental assistant gave me a great opportunity to revisit those sleek black hulls that I once inhabited as a young officer. Prior to transferring to the Civil Engineer Corps, I spent three and a half years aboard fleet ballistic missile submarine the USS *Lewis and Clark* (SSBN 644) as a strategic weapons officer. During my tour I earned the coveted "gold dolphins," which signify that an officer is qualified in submarines.

At COMSUBLANT, I was tasked with updating the Submarine Standard Organization and Regulations Manual (SSORM). The update was badly needed because of the growth of environmental regulations affecting the Navy and the submarine force. Some of the areas that were covered in the SSORM change were overboard disposal of oily waste, hazardous waste, medical waste, plastics, trash and garbage.

Because of the need for submarines to remain undetected, submarines have always been sensitive about how and where pollutants were discharged. That meant the revised policy needed to reflect COMSUBLANT's continuing concern for protection of the environment while not becoming too restrictive on submarine operations.

Since I did not have an environmental background, I reviewed Office of the Chief of Naval Operations (OPNAV) and Commander in Chief, U.S. Atlantic Fleet (CINCLANTFLT) instructions and messages governing environmental topics. My focus was to tailor the guidance from higher authority and make it specific to submarines.

Because of limited storage space and operational commitments, compliance with environmental regulations posed problems for submarines. For instance, regulations called for non-food contaminated plastics to be kept onboard for at least 20 days if the ship was operating beyond the 50 nautical mile point. Unfortunately, submarines have limited space for compliance with this regulation. One of the solutions to this problem is to reduce the amount of plastics that are brought onboard.

After developing a draft of the instruction, I took a copy of the change with me as I spent a week underway on the Los Angeles class fast attack submarine, the USS *Hyman G. Rickover* (SSN 709). While onboard, I reviewed the proposed change with the ship's department heads, the officers of the deck, hospital corpsman, and some of the crew's enlisted members. My major concern was that the SSORM change be concise and easy to read. Everyone on the submarine was very interested in how they could help protect the environment.

After that first ride as a CEC officer on *Rickover*, I had a ride on the USS *John Marshall* (SSN 611). During this underway I gathered information to assist me in developing an environmental compliance organization for submarines. I asked pertinent crew members (the commanding officer, executive officer, engineer, supply officer, chief of the boat (the command's senior enlisted person) and corpsman) how they thought they fit into the ship's efforts to comply with environmental laws and regulations.

The feedback I received enabled COMSUBLANT to develop the shipboard environmental organization to meet the needs of the submarine force and the Navy.

As I visited different watch stations on the sub, I was frequently stopped by officers and enlisted alike, who took an inquisitive glance at the gold dolphins on my chest and the CEC insignia on my collar, and asked "what do you do" or "what is that collar device, I've never seen that before?" This gave me an opportunity to inform the submarine community about the Civil Engineer Corps and the Naval Facilities Engineering Command community. I often had to start my explanation with "have you ever heard of the Seabees?" Most frequently, the answer would be yes, then I would explain how the Seabees, CEC and NAVFAC are all part of one big family and how we support the operational Navy.

One example of that support was my opportunity to develop afloat environmental policy for the Atlantic Fleet submarine force. ❑

LCDR Walden is the facilities director at the Naval Healthcare Support Office in Norfolk, Va.

TQL can be implemented successfully, if you have a plan

By LCDR Anthony J. Cox, CEC, USN

Implementing Total Quality Leadership principles to improve quality and services in the midst of cutbacks is scary. A great deal of material has been published and taught on TQL philosophy, but not much has been written on the implementation of TQL. However, some general points on implementing and then institutionalizing TQL have been learned at the Naval Facilities Engineering Command (NAVFAC) headquarters and in its field activities as those organizations have introduced TQL principles into the workplace.

Deciding to start

TQL is a systematic leadership and management approach to continuously improve, through the participation of all levels and functions of the organization, goods and services to satisfy the customer. This definition embraces the three foundations of TQL: continuous improvement, customer orientation and teamwork.

• *Continuous improvement* is the essence of TQL. Everyone in the organization should know and act upon the knowledge that any product, process or service can be improved. Products can be made and delivered with greater performance and higher reliability.

• *Customer orientation.* Everyone knows the chain-of-command. However, the second "chain" in most organizations is hardly ever emphasized: the chain of customers. Together the chain of customers and chain of command form a chain-net fabric that gives the organization true strength.

• *Teamwork* is the means by which we continuously improve products. Teamwork and leadership must replace management-by-objectives. Setting division goals without worker (team) participation and then coercing goal accomplishment destroys quality.

Implementing TQL causes pain. Top management finds it painful to loosen the reins of power in a traditionally bureaucratic organization. It is painful for the front line worker to adjust to radical changes fostered by TQL. Middle management finds implementing painful because changing decision-making from an individual to group basis may even mean abolishment of some middle-management jobs. TQL implementation is painful, but it is worth it, not only for improvement of services and products, but for survival in today's defense environment.

Beware the "you-can't-implement-TQL-in-the-middle-of-a-_____ (reduction in force or base closure study, for example)" attitude. For most situations, the best defense is a good offense. Public works departments, engineering field divisions, and NAVFAC headquarters have all begun implementation of TQL as a proactive way to weather reductions in force.

Implementing TQL

You must have a plan for TQL implementation. Some important tips are:

• *Timing is everything.* Don't announce a TQL implementation plan the day after Christmas or the week before the end of the fiscal year. Pick a quieter time.

• *Ease into it.* As the top manager in an organization, first train yourself in Total Quality Leadership principles. TQL implementation cannot be delegated. Anything short of your total commitment to TQL is instantly perceived by members of the organization as lip service. It is nearly impossible to reverse course and unlearn poorly taught TQL concepts or a bad implementation experience. If you're facing this challenge, take things slowly to flush out the "bad TQL taste" in the organization's mouth.

LCDR Anthony J. Cox is the environmental officer at the Marine Corps Air Station in Beaufort, S.C. He is a registered professional engineer in Florida.

Art by Bill Brack

"Organizationally, upper management and front-line workers adopt TQL principles much quicker than middle management."

To avoid organizational resistance to TQL based on unfortunate experiences, forget the buzzword of "TQL" or "TQM." Simply *living* the philosophy and principles on a daily basis will speak volumes more than any buzzwords.

• *Share the story.* When you announce an organization-wide TQL implementation effort, make sure there are no surprises. Mention the up sides and the down sides that TQL implementation will bring.

Unless you're a TQL expert, get help from outside the organization. The Navy has trained facilitators and has excellent training courses to offer, but an outside consultant who can provide a comprehensive training and facilitation package on-site should also be considered. "We can't afford it" is not an excuse. You can't afford *not* to get help from an outside, neutral source. One or two roadblocks to operations efficiency that are demolished through a properly taught teaming process will quickly pay back any consultant's fee.

Start with a small seed group of significant players (your "A-team"). If there is any reservation to implementing TQL at this point, stop and get these reservations resolved. If necessary, plan a trip for you and your A-team to an activity where TQL is up and running well.

• *Strategic planning.* The A-team must reach a consensus on the focus of implementing TQL. Each organization will embrace TQL in a different way. Generally, the A-team will nominate an executive steering group (ESG) to act as the "governing body" of the organization. The first order of business for the ESG is strategic planning. The ESG should:

✓ Develop an organizational mission statement. Answer the questions "What business are we really in?" and "What business should we be in?"

✓ Identify trends. Make assumptions made about the "state" of the business environment for the current plan period.

✓ Establish a vision. Describe the organization in the future (at the end of the plan period).

✓ Identify vital issues. Brainstorm and set priorities for the top organizational issues needed to achieve the vision. These issues, stated as accomplishments, are broken down into goals covering the plan period, with short range (usually annual) objectives that support each goal.

• *Team building (implementing the strategic business*

plan). Once the strategic plan begins to come together, implementation efforts throughout the organization must begin. A concurrent orientation of the main body of the organization, along with specialized training of teams to handle specific corporate issues, seems to work best. Team building lessons learned are:

✓ The team structure is not the limit of TQL in the organization. Those who think so have already labeled TQL as a "program" in their minds.

✓ Don't get "teamed out." Start with implementation of one or two of the most vital key issue areas. Set up one quality management board (QMB) for each of these issue areas. Have the QMB select one specific problem for a process action team (PAT) to investigate. The idea is to select a problem with a good chance of success and a high payback in terms of organizational confidence in the teaming process.

✓ Each team's membership begins with nominations from the sponsoring team. *No one should be forced to be on a team.* Nominate team members based on:

- *Interest.* The problem is close, or even personal, to the member.
- *Expertise.* Significant knowledge of the topic.
- *Control.* Line authority to implement recommendations of the team.
- *Accessibility.* The member can access data and do research required by the team.
- *Availability.* The member will be allowed and encouraged to show up.
- *Commitment.* Nothing destroys a team faster than no shows.

• *Implement solutions!* As the teams report out to the ESG, implementing team solutions becomes a line responsibility. The ESG is a critical link to the line structure, transforming solutions to work procedures.

Team solutions made at this stage must be implemented immediately or the TQL effort will dissolve. The ESG should translate the solution directly to the line, with the appropriate PAT acting as the implementation consultant.

Institutionalizing TQL

Once the solutions to your "high mileage" problems are implemented, amazing things start to happen. The closest thing to a perpetual motion engine is an organization fired up about pleasing its customers and making improvements every day. Do not, however, stop fueling this engine! There's still a long way to go:

• *Celebrate the successes!* Catch the bow wave of enthusiasm and make the most of it, with an in-house awards ceremony or an externally focused event. One public works department organized a public works exposition by setting up display booths on services provided, entertainment (dunk the boss) booths, parades and banners. Events like this capitalize on TQL-based improvements and create team pride in the workforce!

• *Make TQL a routine work process.* Training in TQL concepts, particularly statistical process control, often stops too high in the organization to be effective. The real focus of statistical process control and process improvements training should be on those who carry out the process—the front-line workers. Foremen, job superintendents, clerks and others who gather data routinely should understand how to manipulate data and use it to control quality in the process they're responsible for.

Don't discourage informal PATs. These voluntarily formed teams that get together and draw out solutions on a lunchroom napkin are a great sign that TQL is becoming institutionalized.

• *Persevere for Total Quality Leadership.* If you're thinking "I'm all for TQL, but not everybody in my organization is," you're not alone. Organizationally, upper management and front-line workers adopt TQL principles much quicker than middle management. TQL initiatives add significantly to middle management workload, primarily because the middle layers in a bureaucracy tend to micromanage. To overcome this, middle management must realize that their "TQL job" *is* their job. The reason there isn't enough time to "do TQL" is because *they're doing their subordinates' jobs for them*!

•••

Can TQL work in your organization? Yes! There is no organization that TQL cannot work in. If your commanding officer isn't full speed ahead, then implement it in *your* department or division. Most of the principles, teaming in particular, will work without commitment from the top...just endorsement. The more committed your boss is, of course, the more success you will have. Convert your boss! ❑

Members of basic class 202. The class graduated on April 8, 1994.

35 Complete basic training at CECOS

Thirty-five members of basic class number 202 have graduated from the Naval School, Civil Engineer Corps Officers, Port Hueneme, Calif. Course work is comprised of eight weeks of specialized training pertinent to the Navy's needs for shore installation engineering, public works management, construction contracting and administration, and Seabee operations.

Basic Class 202

Name	Degree/College	Duty Station
LT Benjamin J. Barrow*★	BSME/Univ. of New Mexico	SUBASE, Bangor, Wash.
ENS Michael W. Bartlett	BIE/Univ. of Minnesota	NORTHDIV Cont. Off., New London, Conn.
ENS Steven C. Bukoski*	BSCE/Prairie View A&M	NAS Atlanta, Marietta, Ga.
ENS Eric C. Cahill	BS Aero. Eng./USC	NETPMSA, Pensacola, Fla.
LT Raymond L. Cournoyer	BSME/USNA	NORTHDIV Cont. Off., Newport, R.I.
ENS David W. Crispell	BSCE/Penn State	EFA CHES, Washington, D.C.
LT Shawn T. Cullen	BSME/USNA	WESTDIV Cont. Off., Travis AFB, Calif.
LT Matthew L. Early	MBA/Univ. of LaVerne	CBC Port Hueneme, Calif.
ENS Lance J. Edling	BCE/Georgia Tech.	NAS Barbers Point, Hawaii
LT Joel D. Fantz	MSIR/Troy State Univ.	EFA MED Cont. Off., Sigonella, Italy
ENS Jason Fournier	BSME/USNA	NORTHDIV Cont. Off., New London, Conn.
LT Peter E. Hanlon*	BSME/Villanova Univ.	EFA CHES Cont. Off., Quantico, Va.
LT Duane A. Jones*	BME/Univ. of Minn.	EFA MW Cont. Off., Great Lakes, Ill.
ENS Kevin K. Juntunen	BSME/Illinois Inst. Tech.	OICC Far East Cont. Off., Iwakuni, Japan
ENS Paula J. Kersey	BSCE/Cath. Univ. of America	NORTHDIV Cont. Off., Warminster, Pa.
ENS Wendy M. Kevan*	BSCE/Stanford Univ.	NAVTRACEN, San Diego, Calif.
LT Theron R. Korsak	BSME/Mich. Tech. Univ.	PWC Great Lakes, Ill.
LT Christopher S. LaPlatney	BSCE/Auburn Univ.	SOUTHDIV Cont. Off., Gulfport, Miss.
ENS Brent A. LeVander	BSME/USC	NAVSUPPACT, Naples, Italy
ENS R. Augustus Z. Lim	BSCE/Univ. of Wash.	EFA NW Cont. Off., Adak, Alaska

ENS Leonard E. Marshall	BSCE/Univ. of Nebraska	NAVSTA, Guantanamo Bay, Cuba
LT Daniel A. McNair	BSME/Calif. State Univ.	SOUTHWESTDIV Cont. Off., Camp Pendleton, Calif.
ENS Wayne W. Mihailov	BSAE/USNA	LANTDIV Cont. Off., Guantanamo Bay, Cuba
ENS William J. Morrissey	BSME/Auburn Univ.	NAVSUPPACT, Souda Bay, Greece
ENS Kevin H. Murai	BSCE/Univ. of Calif. Davis	EFA NW Cont. Off., Adak, Alaska
ENS George E. Odorizzi	BSEE/Univ. of Ill.	EFA MW Cont. Off., Great Lakes, Ill.
ENS Joshua B. Pearlman	BSME/Univ. of Rochester	ADMINSUPU Bahrain IS
ENS Ray P. Robinson	BSME/George Wash. Univ.	NAS New Orleans, La.
ENS Robert S. Russell	BSCE/Rutgers Univ.	SOUTHDIV Cont. Off., Key West, Fla.
ENS Craig J. Steele	BSCE/Purdue Univ.	MCAS, Cherry Point, N.C.
ENS Daniel E. Tomek	BSEE/Roch. Inst. Tech.	EFA MW Cont. Off., Great Lakes, Ill.
ENS Rod W. Tribble	BSME/Univ. of Central Fla.	SOUTHWESTDIV Cont. Off., MCLB Barstow, Calif.
LT John D. White*①	MSME/Univ. of Central Fla.	PWC Pearl Harbor, Hawaii
ENS Eric T. Whiteley	BSCE/Union College	SOUTHDIV Cont. Off., Key West, Fla.
LT Michael D. Williamson	BSME/VMI	WESTDIV Cont. Off., Point Mugu, Calif.

* With Distinction ★ Class Commander ① First in Class

Reserve Officers

These reserve officers were part of basic class 202 during the period Jan. 24, 1994 - Feb. 9, 1994.

ENS Steven W. Appel	ENS Jane E. Lagerquist	ENS Roger B. Swartwood
CWO2 James M. Carson	ENS Charles A. Lickteig	ENS David K. Thaemert
ENS Glenn P. Deppert	CWO3 Barry L. Mackebon	ENS Frederick A. Turman
ENS Bernard T. Donahue Jr.	ENS Regina G. Marengo	CWO2 John S. Wall
ENS Theodore L. Grabarz	ENS Kirk B. Nakahira	ENS Michael G. Williamson
ENS David J. Hahn	ENS Craig J. Rachupka	ENS Bruce A. Young
ENS Garland G. Harris	ENS Scott A. Stevens	

Attention all engineering students!

You can secure your future in the Civil Engineer Corps, where qualified engineering students may earn more than $1,200 per month. If you are interested in qualifying for the Civil Engineer Corps, contact one of these officers for more information:

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BUPERS, PERS 4413D
Washington, DC 20370-4413
(703) 614-3635/6

LT Gary L. Wick, CEC, USN
WESTDIV, Code 09L1
900 Commodore Dr.
San Bruno, CA 94066-2402
(415) 244-2005

LT Paul F. Webb, CEC, USN
EFA Chesapeake, Code 09PR
Washington Navy Yard
Washington, DC 20374-2121
(202) 433-7285

OR CALL:
1 (800) 327-NAVY

NEWS WORTH REVIEWING

Training to be consolidated at CBCs

In an effort to increase efficiencies and reduce cost, the Navy, Army, Air Force and Marine Corps will consolidate construction and construction engineer training at five centers of excellence.

The Naval Construction Battalion Centers in Gulfport, Miss., and Port Hueneme, Calif., have been chosen as two of the centers of training excellence. Navy will begin the consolidation of its training in October 1994, with full implementation of the four services by October 1995.

When consolidation is fully implemented, annual student load will increase by 1,305 students at Gulfport and 1,127 students at Port Hueneme.

Joint training at Gulfport will include Army, Navy and Air Force entry level carpenters, builders, structures and steelworkers. Port Hueneme will conduct entry level Navy and Air Force vehicle and construction mechanic, and advanced Air Force vehicle mechanic training. Navy entry level equipment operators and engineer aids students will attend consolidated courses at Fort Leonard Wood, Mo. Navy entry level construction electricians and utilitiesmen students will consolidate training with the Air Force at Sheppard Air Force Base, Texas.

Women are being ordered to the NMCBs

In two moves that further signify the Navy's commitment to complete integration of women throughout the Navy, recruiting goals for enlisted sailors will no longer be established by gender, and women are being ordered to duty at naval mobile construction battalions.

The change in recruiting goals marks the first time in the Navy's history that enlisted recruiting for Seabees has been gender neutral. Officer recruiting became gender neutral in March 1994.

The change in assignment policy for Seabees is significant, because it opens more than 4,000 sea going billets to women, in all eight construction battalions. More than 100 enlisted women and 14 women officers are under orders to these units, and by October 1994, all eight NMCBs will have women assigned.

The first women to be assigned to the naval mobile construction battalions reported in April.

Lieutenant Michaela Bradley, CEC, USN, became the first female officer to report to NMCB 133. LT Bradley is a former steelworker first class.

Builder Chief Cheryl Hundley made history on April 5 when she reported to NMCB Five as the first "occupational field 13" female.

The first non-occupational field 13 to report was Storekeeper Senior Chief Susan Garcia-Heng. SKCS Garcia-Heng, who reported to NMCB Four, has had extensive experience in the Naval Construction Force.

NAVFAC receives DOD value engineering awards

One Naval Facilities Engineering Command field division and two NAVFAC employees have won Department of Defense Value Engineering Achievement Awards.

The **Southern Division** won in the Navy field command category; **Michael Koga**, from the Pacific Division, won in the Navy program management category; and **Lindsey K. Gardner**, from the Atlantic Division, won in the Navy professional category.

SOUTHDIV was cited for its customer-focused value engineering process that begins by involving the customer in the VE process at the start of design and in later stages of the formal VE study. The customer is involved and has a substantial role in deciding the recommendation of acceptance.

Michael Koga introduced a new VE technique called Functional Analysis Concept Development, in which VE methodology is applied from the beginning of design concept development.

Lindsey K. Gardner, during his 10 years as NAVFAC's program manager for value engineering before retiring recently, implemented a VE program that saved the command more than $1 billion and trained more than 1,000 people in VE methodology.

NAVFAC wins award

The Naval Facilities Engineering Command has won a Secretary of the Navy FY 93 Award for Achievement in Safety Ashore.

NAVFAC won in the major command category for its outstanding year in mishap prevention. In FY 93, NAVFAC achieved a 21.5 percent reduction in the civilian workers injury compensation total case rate.

Family recreation center opens in Pensacola

The Navy's newest Neighborhoods of Excellence (NOE) project, a recreation facility, opened in Pensacola, Fla., in July.

The family recreation complex features tee-ball and major league ball fields, soccer/football field, basketball, tennis and volleyball courts, and a super tot lot for the smallest family members.

Joggers in the family can enjoy the 8-foot wide trail that winds throughout the complex located adjacent to Corry Village family housing.

This recreation complex is a glowing example of what the Neighborhoods of Excellence in Pensacola is offering the Navy family.

New standards are approved for BEQs

The Office of the Secretary of Defense has approved new standards for bachelor enlisted quarters beginning in FY 96.

For E1 to E4, the old shared 90 square feet per person including wardrobes has been increased to two private sleeping areas of 110 square feet plus 20 square feet for closets. Bathrooms and kitchenettes will be shared by two people. For E5 to E6, the new larger units will be private, not shared. One area will be used for a bedroom and the other for a living room.

All new units will be built to these standards. When possible, older units will be renovated to meet these standards. These key quality of life improvements are increased privacy, increased living and storage space and a small but functional area for food preparation.

Action grants turn ideas into improvement projects

The Neighborhoods of Excellence commanding officer's action grants have been out a short time, but the reception is positive and the response has been immediate.

Action grants give commanding officers the ability to select an area for improvement within a family housing neighborhood and have the improvement completed in an expeditious manner.

Since the funding for the grants is current fiscal year funds, an activity must have the ability to execute within the fiscal year. Activities are encouraged to submit action grant requests for projects expected to cost approximately $50,000.

Some of the projects suggested for action grants include neighborhood signage, entry landscaping, bus shelters or recreation facilities such as bike paths or tennis courts. For more information, call your engineering field division housing action officer.

1993 Marvin Shields Award winner announced

The Society of American Military Engineers has selected Equipment Operator First Class Kelly J. Ryan as the recipient of the 1993 Marvin Shields Award.

The award is presented annually to recognize men or women who have made an exceptional contribution to military construction, facilities maintenance, training or readiness. He was selected based on extraordinary accomplishments while assigned to Naval Mobile Construction Battalion 40, including exceptional enthusiasm and technical competence while preparing for and deploying to Somalia and Guam.

CBMU 302 is decommissioned

Construction Battalion Maintenance Unit 302 was decommissioned in Guam on July 18. Commissioned on March 31, 1967, CBMU 302 was initially homeported in Cam Rahn Bay in the Republic of Vietnam. The CBMU was responsible for the construction and maintenance of runways, roads and shelters, and the Vietnamization program. At one point, CBMU 302 had more than 1,400 men assigned, making it the largest Seabee battalion since World War II. It was the last battalion-sized unit to leave Vietnam.

In January 1972, CBMU 302 completed the withdrawal of all detachments from Vietnam and deployed to Construction Battalion Center Port Hueneme, Calif. By April 1972, the unit's manning had been reduced to eight enlisted men and one officer, and the unit had a new homeport at Subic Bay, Republic of the Philippines.

Since that time, CBMU 302 has established a distinguished record of peacetime performance. One of the unit's greatest challenges came in June 1991, when Mount Pinatubo's volcanic eruption and the concurrent passing of Typhoon Yunya inundated the U.S. facility with more than eight inches of wet ash and sand. Throughout the storm, the unit dispatched search and rescue and engineering assessment teams. The unit's efforts after the storm were instrumental to the facility's recovery from the disaster. In July 1992, the unit moved from Subic Bay to Camp Covington, Guam.

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The 108th NCB...

Continued from page 11

was the first to tie up, bow-first, to the pier head. "We all clapped when the first truck roared off the LST."

If surviving the German gunners were not enough, the pier head crews were tested to the limit on June 19, when the worst storm in 40 years blew in from the east.

"We were ordered to tie ourselves to the pier so we wouldn't be washed overboard," Dierkes recalls. "We lost three spuds out of four, and small craft crashed into us and cut holes in our sides." Finally, the Seabees were ordered to evacuate the pitching and sinking pier head.

"The waves were so high the tug had a hard time holding its bow to our side. We were told to jump onto the tug. Half of us made it, but Bill Van Eck was so scared he wouldn't jump," Dierkes says. When the Seabee did jump, a wave tossed the tug away from the pier head, and he fell into the water. A long minute later, he surfaced and tried to stay afloat, but his strength was nearly gone.

"We put a ladder into the water. Bill grabbed it, but couldn't make it up." Dierkes and another man went into the water, tied the Seabee to the ladder, and the others hauled him up onto the deck.

By the time the storm blew itself out on June 22, the American mulberry harbor was all but wrecked. It was only partially rebuilt. The British mulberry, farther east, had not been completed, and was protected by a reef.

The Allied invasion forces continued to roll across France, routing and capturing the occupying Germans. On June 28, Cherbourg was captured by the American forces. Seabees, working with salvage teams, cleared the harbor for Allied shipping. Then, for the Seabees of the 108th NCB was a well-deserved rest in England, and redeployment. The unit packed out, sailed for the States for 30 days of rest and recreation, then deployed to the island hopping campaigns in the Pacific theater.

•••

Raymond B. Dierkes is in his 70s now. Following his naval service, he returned to work as a plumber, winding up a long career as president of the Missouri Plumbing, Heating, Cooling Contractors Association. In addition to enjoying his grandchildren, he is active in the 97th and 108th Seabee Organization, and edits its newsletter, *Bee-Lines*. Ray Dierkes still keeps in touch with the guys from the 108th, and is planning to attend its 27th annual reunion this fall, in San Antonio.

For membership information write, Raymond B. Dierkes, National Secretary, 97th and 108th Seabee Organization, 4417 Carriage Trace Drive, St. Louis, Mo. 63128-3150. ❑

Seabee bulldozer builds a causeway to the ramp of a rhino ferry at Normandy.

On the Isle of Wight, Vice Admiral Ben Moreell, CEC, USN, talks to a lieutenant in front of a spud pierhead set up to practice for the Normandy invasion.

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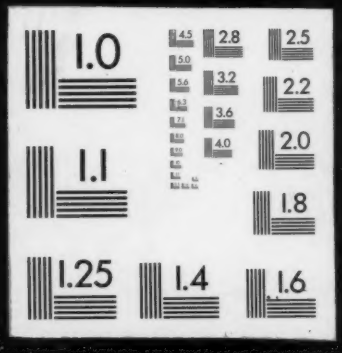
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